

PATENT SPECIFICATION

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PROVISIONAL SPECIFICATION

A Process of Waterproofing Pre-Cast Articles of Gypsum Plaster or Gypsum Cement

We, THE BRITISH PLASTER BOARD LIMITED, a British Company, of Wallasey, Cheshire, BERNARD JOSEPH CAFFERATA, of "Cotswold", Coddington Road, Newark-on-Trent, Notts., CUTHBERT LESLIE HADDON, of 16, The Park, Newark, Notts., and GERALD WATERWORTH CAFFERATA, of "Fairways", Grantham Road, Radcliffe-on-Trent, Notts., all British Subjects, do hereby declare the nature of this invention to be as follows:—

The invention relates to the waterproofing of precast articles of gypsum plaster or gypsum cement, its object being in particular to impart to such articles increased resistance to erosion by running water.

According to the invention the precast article is immersed in a solution of one or other of the following substances, or of any two or more of them:

Oxalic Acid.
Ammonium, Sodium or Potassium salts of Oxalic Acid.

Ammonium, Sodium or Potassium salts of Phosphoric Acid.

The article to be treated is preferably dried before immersion. A 10% solution of any of the substances named in a

strength which we have found suitable, with a period of 24 hours for the immersion, but the strength and period may be varied within wide limits. Generally speaking, increasing the period of immersion increases the degree of waterproofing obtained, and the same may be said with respect to the strength of the solution.

We have obtained the best results with plasters and cements containing a percentage of calcium hydroxide and/or calcium carbonate, the following being, for example, a suitable composition:

Low water mix plaster of Paris	-	80%
Calcium hydroxide	-	10%
Calcium carbonate	-	10%

Polishing the treated article with a hard wax polish substantially increases its resistance to erosion by running water, whereas the application of such polish to untreated articles of the same kind is of little or no value for that purpose.

Dated this 8th day of November, 1940.

For the Applicants,
HERBERT HADDAN & CO.,
Chartered Patent Agents,
31 and 32, Bedford Street, Strand,
London, W.C.2.

COMPLETE SPECIFICATION

A Process of Waterproofing Pre-Cast Articles of Gypsum Plaster or Gypsum Cement

We, THE BRITISH PLASTER BOARD LIMITED, a British Company, of Wallasey, Cheshire, BERNARD JOSEPH CAFFERATA, of "Cotswold", Coddington Road, Newark-on-Trent, Notts., CUTHBERT LESLIE HADDON, of 16, The Park, Newark, Notts., and GERALD WATERWORTH CAFFERATA, of "Fairways", Grantham Road, Radcliffe-on-Trent, Notts., all British Subjects, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The invention relates to the treatment of precast articles of gypsum plaster or

gypsum cement, for the purpose of increasing the hardness of their surfaces, and their resistance to water, the improved wearing quality being manifested in particular by the increased resistance of the surface to erosion by running water.

According to the invention we treat the said precast articles by immersion in aqueous solutions of the ammonium, sodium, and potassium salts of oxalic acid or of phosphoric acid, or in a solution of oxalic acid, or of mixtures of these reagents, the strength of the solutions being in general about 10% where the duration of the immersion is about 24

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hours, and greater or less if the duration is shortened or increased.

- It has heretofore been proposed to restore concrete structure by squirting into the cracks, or into bored holes, solutions of various kinds, including dilute solutions of phosphates. A proposal put forward at one time, for converting gypsum into marble, was that of immersing the gypsum in a solution of sodium borate to which a very minute proportion of potassium phosphate or oxalic acid might be added.

- We must point out that where for the purposes of our invention we direct the use of a solution of phosphate or oxalic acid, that solution is not one in which borate is present.

- With regard to the use of oxalic acid in our invention it must be stated that this reagent is only suitable for treating articles of calcium sulphate plasters or cements in which lime (preferably hydrated) and/or calcium carbonate is or are present.

- With regard to the sodium and potassium salts mentioned it must be stated that while they serve to increase the resistance to running water they may give rise to an efflorescence on the surface of the specimens, and for this reason we generally prefer to use the ammonium salts of phosphoric or oxalic acid.

- In the case of the phosphates we have found, generally, that a pH value of the order of 7 to 9 gives the best results. A low pH value gives markedly inferior results.

- Where calcium carbonate or calcium hydroxide is absent from the specimens, a still more alkaline solution gives better results.

- The solutions used may be cold or hot, and we have obtained good results with a hot or cold saturated solution of ammonium oxalate with an immersion period about 24 hours, also with a cold or hot 10% solution of di-ammonium phosphate and a similar immersion period of 24 hours is also suitable.

- A mixture, cold or hot, of a saturated solution of ammonium oxalate and 10% di-ammonium phosphate, with about 24 hours immersion, is very suitable, and generally speaking we find that mixtures of phosphates and oxalates and/or oxalic acid give the best results.

- Before immersion, the precast articles may be dried, but this is not essential.

- It is preferred to use dense casts and plasters or cements having low water mix characteristics.

- We have generally obtained the best results with calcium sulphate plasters and cements to which finely ground cal-

cium carbonate and/or lime, preferably hydrated, have been added. A good example of such a mixture is the following:—

	parts by weight	70
Calcium Sulphate Plaster or Cement	- - -	80
Lime, preferably hydrated	- - -	10
Calcium Carbonate, finely ground or precipitated	- - -	10
		75

Oxalic acid and the oxalates used alone give a hard, thin and very water resistant skin to the surface of the article, and erosion of this skin does not occur till after the prolonged action of running water. The phosphates carry the process to a much greater depth in the specimen, but the surface is not quite so hard. It is apparently for this reason that the best results are generally obtained with mixtures of the phosphates and oxalates and/or oxalic acid.

A highly suitable solution is as follows:—

A 10% solution in water of di-ammonium phosphate to which sufficient ammonium oxalate is added to saturate it. About 3—4% of ammonium oxalate suffices for the purpose. The solution may be hot or cold. Immersion of the article, cast in the above mentioned mixture of calcium sulphate plaster or cement, calcium carbonate and lime or hydrated lime, for 24 hours, suffices to impart to the cast a hard and highly resistant surface to running water.

A 10% solution of di-ammonium phosphate alone may be employed, but the hardness and water resistance of the surface are inferior to those obtained with the above mixture. Stronger solutions than those indicated above may be employed, and the period of immersion cut down.

Too strong a solution or too prolonged an immersion tends to craze or crack the surface. This is specially marked when oxalic acid and/or oxalates are absent from the solution.

In certain cases alteration of the pH value may affect the results, e.g. a mixture of oxalic acid and di-ammonium phosphate gives inferior results to ammonium oxalate and di-ammonium phosphate unless there is a considerable amount of free lime present in the cast.

Polishing the treated articles with a hard wax polish substantially increases its resistance to erosion by running water, whereas the application of such polish to untreated articles of the same kind is of little or no value for that purpose.

Having now particularly described and

ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

- 5 1. The process of treating pre-cast articles of gypsum plaster or gypsum cement by immersion in aqueous solutions of the ammonium, sodium or potassium salts of phosphoric or oxalic acid, or in a
10 solution of oxalic acid, the oxalic acid being used only where the cement article contains calcium carbonate and/or lime, the strength of the solution being about 10% where the period of immersion is
15 about 24 hours, and lower or higher where the period is longer or shorter respectively.

2. The process claimed in claim 1, applied to pre-cast articles composed as to about 80 parts by weight of calcium sulphate plaster or cement, as to about 10 parts by weight of lime, and as to about 10 parts by weight of calcium carbonate, for the purpose set forth.

3. The process claimed in claim 2 wherein the lime present is hydrated.

Dated this 30th day of October, 1941.

For the Applicants,
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